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# THE VETERINARY JOURNAL

## A MONTHLY REVIEW OF VETERINARY SCIENCE

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# The Veterinary Journal.

OCTOBER, 1935.

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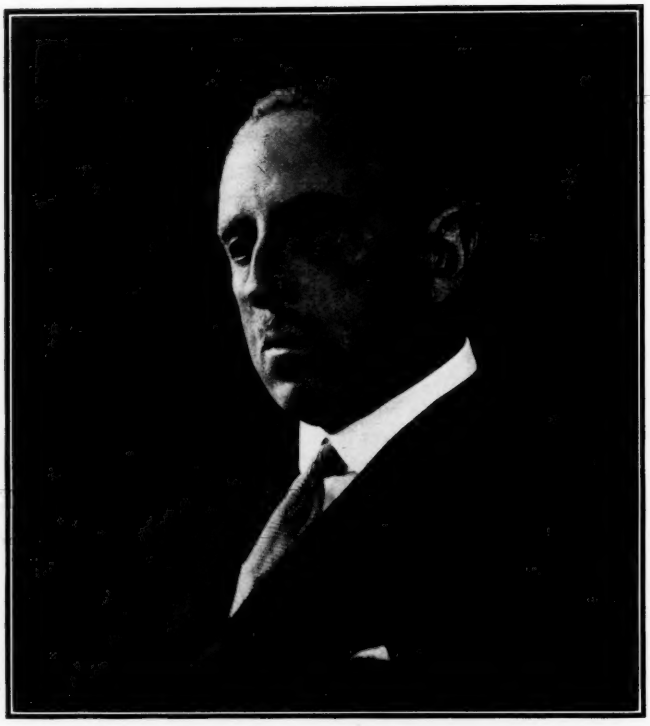

PRINCIPAL J. J. O'CONNOR, M.R.C.V.S.

*The newly-elected Principal of the Veterinary College of Ireland.*

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OCTOBER, 1935.

## Biography

## PRINCIPAL J. J. O'CONNOR, M.R.C.V.S.

THE selection of Professor J. J. O'Connor for the Principalship of the Veterinary College of Ireland will be received with pleasure by members of the veterinary profession, not only in Ireland, but in Great Britain as well.

The son of a farmer, born in County Dublin and educated in Dublin City, Principal O'Connor spent his early years amongst pedigree stock, and it was here that he laid the foundation of the reputation which he has built up as a surgeon and consultant. His veterinary career was taken at the Royal (Dick) Veterinary College, from which he qualified in 1899, being afterwards selected for the post of Hospital Surgeon and Lecturer in Stable Management and Shoeing. In 1902 he was appointed to the Professorship of Surgery, the onerous duties of which, however, did not check Professor O'Connor's desire to assist the backward student and to do good work for his profession by helping forward veterinary literature from the surgical aspect; the most noteworthy example of unselfishly " burning the midnight oil " being the review of " Dollar's Surgery."

Socially, Professor O'Connor has always been to the fore, and in this he has been ably assisted by Mrs. O'Connor, and no dance or dinner affected by the veterinary profession in Ireland is complete without them both.

Secretary for over twenty years, and President twice, of the Veterinary Medical Association of Ireland, and President of the Irish Free State Veterinary Council, Principal O'Connor has proved his capability to rule; and members of the veterinary profession can rest assured that the Veterinary College of Ireland will have a tactful exponent of its rights, and that whatever is its due will be acquired—if such is at all possible.



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# Editorial

## MINISTRY OF NORTHERN IRELAND—SPAHLINGER REPORT.

THE test work which has been recently carried out in the North of Ireland, on premises specially set side for the purpose, certainly appears to have borne fruit; but the numbers in each group are too small upon which to decide so momentous an issue, and it will be wise precaution, before launching it upon the agricultural and dairy community, that the observations shall be continued (and effects reported upon) by a further committee of scientists selected for their intimate knowledge of the subject, and also for their knowledge of the needs of the practitioner and the difficulties under which he already labours and does so much. If the results are confirmed by trial on a larger scale there is no doubt that the treatment will prove to be of the very highest value, both to animals and human beings—for the elimination of the tuberculous cow is of vital importance to a pure milk supply; and tuberculosis, above all other diseases, is one of those to which the old adage about "prevention being better than cure" is especially applicable.

An abstract of the Official Report, issued by the Government Veterinary Department for Northern Ireland, is given in our present issue, and a full Report of the actual details of the experimental work carried out can be obtained by all who desire to have it, upon application to the proper quarter.

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## HORSE-BREEDING IN IRELAND.

THE general public never completely realises the enormous part which is played by veterinary science in all countries in regard to the maintenance of the health of livestock. In the recent evidence given before a Commission of Inquiry into the Free State Horse-breeding Industry it was stated that there was at least £10,000,000 worth of horses in the Free State, and that about 9 per cent. of the male population over fifteen years of age is directly, or indirectly, dependent for a living on the horse-breeding industry.

Some 60,000 people are employed in the care and management, and other business sides, such, for instance, as the production of oats and other corn, which alone gives employment for at least 7,500.

The Irish-bred horse has earned a reputation for itself in every country of the world, especially for racing and hunting, and is still in great demand, but at present the breeding industry is almost entirely a matter of private enterprise; and the hope is that more Government support will be the result of the findings of this Commission of Inquiry.

That this will also be of interest to our profession goes without saying, for the time always comes when the veterinary surgeon must be called in to perform his duty by the control of epidemics and the cure of sickness.

Our comparative freedom from numerous epidemics which devastate the horses and cattle of Continental countries is the envy of the civilised world; and although the fact that we are surrounded by a broad belt of water does certainly count for a great deal, it is the knowledge developed by the veterinary surgeon upon which depends the welfare of our flocks and herds.

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# General Articles

## ABSTRACT FROM THE NORTHERN IRELAND SPAHLINGER REPORT (1931-34).*

THE long-expected report on Mr. Henry Spahlinger's tuberculosis immunising vaccine from the Veterinary Department of the Government of Northern Ireland has at last made its appearance, and, on the face of it, it is certainly interesting reading; and the deductions made seem to be more than ordinarily encouraging, not merely as laboratory experiments, but in the sequelæ under conditions which may almost be said to be "every day" ones in the field. Prior to the Spring of 1930, Mr. Spahlinger had been trying for several years to introduce his immunising and curative vaccines, but without much success, for it seemed hard to convince the scientific world that anyone without a medical or veterinary qualification could produce this wonderful result over which every scientific worker had, up to the present, failed.

The Report commences with an introduction addressed to the Minister, the Rt. Hon. Sir Basil Brooke, by Mr. G. S. Robertson, of the Ministry of Agriculture at Stormount, Belfast, briefly drawing attention to the results attained, and passes on to an introduction in which it is mentioned that in April, 1930, Sir Lynden Macassey, K.B.E., K.C., drew the attention of the Ministry to the work in which he and a number of other prominent persons had been associated with certain tests of Mr. Henry Spahlinger's anti-tuberculosis bovine vaccine as a means of immunising cattle against tuberculosis. He submitted to the Ministry reports and documents apparently showing the efficacy of the Spahlinger dead vaccines against lethal doses of tubercle bacilli. The first of these vaccines had been prepared by Mr. Spahlinger as far back as 1916, but it was stated to be difficult and expensive to produce, and a series of vaccinations were necessary in order to confer on cattle complete immunity from lethal doses of virulent tubercle bacilli. Sir Lynden also submitted evidence concerning a "simplified" dead vaccine which Mr. Spahlinger had produced in 1925. The "simplified" vaccine had the merit of being relatively cheap to produce and only one vaccination was stated to be necessary to confer immunity on cattle for a long period. A report on a series of experiments carried out with the simplified vaccine under the supervision of Dr. Antoine Bron appeared to show that calves vaccinated with the Spahlinger vaccine did not contract tuberculosis even when many times the lethal doses of virulent bovine tubercle bacilli were injected into the blood stream; whereas unvaccinated calves, when injected with identical doses of virulent tubercle bacilli, succumbed rapidly.

* This Report is reproduced, by permission of The Controller of H.M. Stationery Office, from the "Report on the Spahlinger Experiments in Northern Ireland, 1931–1934," published by H.M. Stationery Office on behalf of the Government of Northern Ireland. The Report, with Appendices and Addenda, may be obtained, price 1*s.* 6*d.*, from H.M. Stationery Office at the following addresses: 80 Chichester Street, Belfast; Adastral House, Kingsway, London, W.C.2; 120 George Street, Edinburgh 2; York Street, Manchester 1; 1 St. Andrew's Crescent, Cardiff; or through any bookseller.

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Sir Lynden also communicated to the Ministry particulars of an experiment with Mr. Spahlinger's vaccine which was being carried out at Captain R. G. Buxton's farm at Petygards, Norfolk, under the supervision of a committee consisting of Major-General Sir Frederick Maurice, Sir Thomas Watts, M.D. ; Sir Bruce Bruce Porter, M.D. ; Mr. Henry Overman, Mr. Alfred Lewis, Chairman of the Norfolk Farmer's Union ; Mr. Guy G. Sooby, M.R.C.V.S., and Mr. B. W. Bloomfield, M.R.C.V.S. The experiment had been in progress for some months, when the then Secretary and Assistant Secretary of the Ministry, on the invitation of Captain Buxton and his colleagues, visited Petygards and were afforded every opportunity of exploring the circumstances and conditions of the experiment. Subsequently, the detailed records of the Norfolk experiment and the report of the Committee were submitted for the Ministry's information. Briefly, the Report of the Norfolk experiment showed that 18 calves had been vaccinated once with Mr. Spahlinger's dead vaccine and that the dose of vaccine had varied from 1/20th of a c.c. to relatively large quantities. Six months after vaccination the 18 vaccinated calves and 5 unvaccinated calves were injected on July 12th, 1930, with identical lethal doses of virulent bovine tubercle. Of the 5 unvaccinated calves, 4 died from generalised tuberculosis within sixty days of the injection of the lethal dose, and the remaining calf was alive when the experiment was concluded. Of the 18 vaccinated calves, one died from tuberculosis 118 days after the test injection. This calf was the one which received the smallest dose of vaccine, namely, 1/20th of a c.c. The remaining 17 vaccinated calves were alive and in excellent thriving condition at the end of the experiment—21 months after the injection of the lethal test dose.

### Northern Ireland Experiment.

SECTION I.

In view of the evidence submitted by Sir Lynden Macassey and his collaborators the Ministry decided to carry out an experiment to determine the efficacy of Mr. Spahlinger's vaccine. The necessary funds were voted by Parliament and the Ministry leased for the purpose a small grass farm of 40 acres.

*Experimental Animals.*—Thirty-two calves were purchased for the experiment. Eighteen of these were secured from the Agricultural Research Institute at Hillsborough. They were the progeny of a cross-bred Galloway herd owned by the Institute and were by an Aberdeen Angus bull. The dams and the sire had all passed the double intradermal tuberculin test. The dams had not been housed for at least three years and the calves were born and reared in the field and suckled their dams. The remaining fourteen calves were purchased from Grade A tuberculin-tested herds transferred a few days after birth to the special experimental farm and there reared out of doors and during the rearing period fed on Grade A (T.T.) milk purchased from the Agricultural Research Institute. All the calves were born during the period June to September, 1931.

*Experimental Goups.*—In addition to a vaccinated and unvaccinated group it was arranged to include at Mr. Spahlinger's request three minor groups into

which would be injected material other than his " simplified " vaccine. The reasons for the inclusion of these groups (2, 4 and 5) are dealt with fully in the complete Report. The groups were as follows :—

Group I—6 animals inoculated with varying doses of Mr. Spahlinger's old dead simplified vaccine which he stated was prepared in 1926.

Group II—2 animals.

Group III—11 animals vaccinated with Mr. Spahlinger's simplified vaccine which he stated was prepared in 1929.

Group IV—2 animals.

Group V—2 animals.

Group VI—9 animals, not vaccinated (controls).

*Conditions of the Experiment.*—(1) It was arranged by the Ministry that the calves in Groups I, II, III, IV and V should be inoculated with the materials by Mr. Spahlinger himself or by the Ministry's veterinary officers under his supervision. For this purpose Mr. Spahlinger visited Northern Ireland on December 6th, 1931, when the inoculations were carried out. Since that date Mr. Spahlinger has had no personal contact with the experiment. The calves varied in age from four to six months at the date of vaccination.

(2) Mr. Spahlinger proposed that the immunity conferred by his vaccine should be tested six months after vaccination by injecting into the blood stream of all the animals through the jugular vein a lethal dose of living virulent bovine tubercle bacilli prepared and injected by the Ministry's veterinary officers and of such a magnitude as was calculated to kill a normal unvaccinated animal in approximately thirty to forty days. The Ministry, on the advice of its veterinary officers, demurred to this condition on the grounds that it was exceedingly improbable that any vaccine could withstand such a drastic test. In view, however, of Mr. Spahlinger's anxiety that the test of the immunity conferred by his vaccine should be of as drastic and convincing a nature as possible, his proposal was accepted.

*Preparation of the Lethal Test Dose of Tubercle Bacilli.*—The test dose of tubercle was prepared by the Ministry's veterinary officers from seven bovine strains, five obtained from milk, one from a tuberculous gland, and the other from a tuberculous lung.

In order to standardise the virulence of the test dose of tubercle 100 milligrams of dry growth of tubercle bacilli were injected intravenously into a six months old calf purchased from a tuberculin-tested herd ; the calf died in twenty days from actual generalised tuberculosis.

Two calves were withdrawn from the control, that is, the unvaccinated group, and injected intravenously with 50 and 10 milligrams respectively of dry growth of tubercle. They died in nineteen and eighteen days respectively from acute generalised tuberculosis. The lethal test dose of virulent tubercle bacilli was finally fixed as 2.5 milligrams of dry growth of tubercle bacilli suspended in 10 c.c. of normal saline.

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*Administration of the Virulent Test Dose of Tubercle Bacilli.*—The test dose of virulent tubercle bacilli was injected into the jugular vein of each of the remaining 30 animals on June 6th by the Ministry's Veterinary Officers. Some measure of the amount of infection may be obtained from the fact that the test dose contained approximately 100,000,000 virulent living tubercle bacilli and that these were injected into the blood stream of each animal. At the time of infection the calves were between 10 and 12 months old, and an interval of six months had elapsed since the experimental groups 1 and 3 had been vaccinated.

In preparing the test dose of tubercle bacilli certain measures were adopted with a view to securing a finely divided emulsion and also to ensure that each animal received a similar dose. It may be that more elaborate methods would secure a finer state of division of the suspended growth of tubercle bacilli in the test dose. Within limits it may be assumed that the coarser the particles of tubercle bacilli suspended in the test dose the more difficult it would be for the defensive mechanism to eliminate the infection.

*Variations in the Experimental Programme.*—Approximately a month before the administration of the test dose and five months after vaccination two of the animals in Group 1 were submitted to the double intradermal tuberculin test, and less than a week before the injection of the test dose of tubercle bacilli a third animal in this group was also tuberculin tested. The three animals reacted. The tuberculin testing was done on the initiative of the Ministry, but without consulting Mr. Spahlinger, the object being to ascertain whether vaccinated bovines reacted to the tuberculin test.

**Results.**

*Group VI (Control Group: unvaccinated calves).*—This group, which originally consisted of 9 calves, was reduced to 7 through the withdrawal of two calves which died of acute generalised tuberculosis in nineteen and eighteen days in the trials already described to standardise the test dose.

Following the injection of the test dose into the remaining seven unvaccinated calves on June 6th, 1932, the animals showed considerable variations in temperature until the tenth or eleventh day, when marked rises in all their temperatures occurred. The animals lost condition rapidly. Five of the seven became emaciated and died 25, 29, 34, 52 and 73 days after the injection of the test dose—average time of death 43 days after injection of the test dose of tubercle bacilli. Post-mortem examination of all five animals showed death to be due to acute generalised tuberculosis.

In the two calves which survived the febrile attack the high temperatures persisted until the thirty-third day and then approximated to normal and remained so thereafter. Both animals remained in good health until they were slaughtered 763 and 879 days after the injection of the test dose. Post-mortem examination showed tuberculous lesions of a non-progressive type in both animals. These two animals belong to the small percentage of bovines possessing a natural immunity to tuberculosis.

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*Group III* (11 *vaccinated calves*).—The eleven animals in this group all resisted the injection of the test dose of tubercle bacilli in a very similar manner. During the first few days there was a rapid rise in temperature, occasional coughing, but by the end of the tenth day temperatures had returned to normal and the animals continued in good health and thriving condition.

Only one animal in this group died before the conclusion of the experiment. The animal was seriously affected with hoose in August, 1933, and shortly afterwards (October, 1933) symptoms of tuberculous meningitis appeared. The attack of hoose may have lowered the resistance of this animal. The animal lay for some weeks and died from pneumonia 607 days after receiving the test dose. The remaining ten animals were slaughtered in the Belfast Municipal Abattoir 780 to 892 days after injection of the test dose, and detailed post-mortem examination carried out by the Ministry's veterinary officers in collaboration with the City Veterinarian, and Dr. Trimble, the Tuberculosis Officer of Belfast.

In general, the post-mortem examination revealed the presence of nodules in the lungs and certain glands. These, when incised, were found to contain either a yellowish oily pus-like substance or cheese-like material. Injection of these materials into guinea-pigs showed the presence of viable tubercle bacilli, but these were not demonstrable on microscopic examination.

Of the remaining 10 vaccinated animals in this group, which were in thriving condition at the end of the experiment and were sent to the abattoir for slaughter, the carcases of 9 of them were passed by the City Veterinarian as fit for human consumption. The rejected animal, which was in quite good condition when slaughtered, was found to have a tuberculous udder and more widespread lesions of tuberculosis than the other animals. It should be added that this animal had developed (August, 1933) a streptococcal mastitis (udder infection) which may have lowered its resistance.

*Group I* (*six animals vaccinated with old vaccine prepared in* 1926).—It will be recalled that of these six animals two (numbered A12 and A13) were submitted through a misunderstanding to the double intradermal tuberculin test one month before the injection of the test dose of tubercle bacilli and one (number A11) a week before.

After the injection of the test dose of tubercle bacilli on June 6th, 1933, the two animals A12 and A13, which had been tested a month previously, behaved like the unvaccinated animals in Group 6 (Control). There was a steady rise in temperature which persisted. The animals became seriously ill and died, A12 thirty-seven days and A13 forty-five days after the injection of the dose, both from acute generalised tuberculosis.

In October, 1933, 510 days after injection of the test dose, A11 (also tuberculin-tested) developed symptoms suggesting tuberculosis of the central nervous system. A living calf was born in June, 1934, but on June 18th, 743 days after the injection of the test dose, this animal died rather unexpectedly. Post-

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mortem showed advanced tuberculosis of the central nervous system, but surprisingly few other lesions were present in the body, the lungs being entirely free.

The three remaining animals in this group which had not been tested with tuberculin survived the injection of the test dose. They continued in excellent thriving condition throughout the whole period of the experiment and were slaughtered fat 779, 778 and 775 days after the injection of the test dose and their carcases passed as fit for human consumption.

It may be that the very small dose of Spahlinger's " old " vaccine used for animals A12 and A13 failed to immunise them and that the larger, but still small, dose used for A11 all but succeeded. On the other hand, it has been suggested to us that the double intradermal test applied to A12 and A13 a month before the injection of the virulent test dose deflected the immunity, and partially deflected the immunity in the case of A11, tuberculin-tested less than a week before the injection of the test dose.

### Conclusions.

The vaccinated animals in addition to the lethal dose of tubercle bacilli injected into their blood streams were subjected during the two years which followed to intense natural infection. The heifers, moreover, were put through the strain of a calving and lactation period. It must, therefore, be concluded in the light of the results obtained, that Mr. Spahlinger's vaccine conferred on the vaccinated animals a high degree of immunity. It is most unlikely that any similar degree of infection to which the vaccinated animals were subjected would be met with under natural conditions, and it is difficult to resist the conclusion that in this vaccine there exists a means of securing a high degree of immunity to any form of tuberculous infection acquired under natural conditions.

## Section II.

### Nature and Source of the Animals used in the Experiments.

The calves from a small herd of eighteen Aberdeen Angus-Galloway cows which were under our charge were utilised. These cows had passed the double intradermal tuberculin test and had been mated with a tuberculin-tested Aberdeen Angus bull. Fourteen other calves from tuberculin-tested herds were also obtained, thus making a total of 32 calves. All the calves were reared out of doors continuously, and were fed on Grade A (T.T.) milk with a view to ensuring, as far as possible, their freedom from tuberculosis. The calves were born during the period June to September, 1931, and at the time of their vaccination on Wednesday, December 2nd, 1931, their average age was approximately four or five months.

They were divided into six main groups as follows :—

Group I—Six (6) animals : A19, A15, A13, A12, A11 and A26.

Group II—Two (2) animals : A21 and A8.

Group III—Eleven (11) animals: A4, A22, A25, A3, A9, A30, A5, A14, A27, A1 and A29.

Group IV—Two (2) animals: A7 and A18.

Group V—Two (2) animals: A17 and A31.

Control Group (Group VI)—Nine (9) animals: A2, A6, A10, A16, A20, A23, A24, A28 and D100.

The following information was supplied to the Ministry by Mr. Spahlinger regarding the respective materials with which the animals of the various groups were injected.

*Group I.*—The vaccine used was described by him as "old" vaccine, which was prepared in 1926. It was noted that the dosage varied.

*Group II.*—"The vaccine used was," he said, "obtained from a strain grown on specific media (*i.e.*, the serum or blood of cattle) and then cultivated for five or six years on potatoes, and again on specific media for four years with the object of seeing whether the prolonged final cultivation on specific media would restore its 'specificity,' that is to say, its complete efficacy as a vaccine which it possessed after its original cultivation on specific media, but which was impaired by its subsequent cultivation on potatoes." "The vaccine had," he said, "been tested against homologous strains with complete efficacy, that is 100 per cent. success," and his object was to see whether it would give immunity against heterogeneous normal strains.

*Group III.*—The vaccine with which this group was treated was Mr. Spahlinger's "new vaccine," which had been prepared in 1929. The dosage and method of preparation are given in the Addenda.

*Group IV.*—"The material used was," Mr. Spahlinger said, "an extract of tuberculous lesions made in 1922, which was filtered, the object being to see whether it would immunise the animals inoculated with it against T. B. infection, or sensitise them, in which latter case they would die before the controls. In previous tests it had affected the inoculated calves in such a way that they died before the control calves." He thought that it might with age have lost its sensitising properties. In view of this information this group might be considered as varying little from the conditions of the control group.

*Group V.*—"The material used was the media on which the cultures were grown. It was the specific culture medium which contained endo- and ecto-toxins which might or might not give immunity or hypersensitiveness according to dosage and frequency of vaccination, *i.e.*, the number of injections and the amount of the material."

Mr Spahlinger suggested that the immunity, etc., produced should be tested by giving the calves, both vaccinated and unvaccinated, an intravenous injection of virulent bovine tubercle bacilli isolated, grown and prepared in the Veterinary Research Laboratory of the Ministry, and that the dose should be of such strength as to bring about death in unvaccinated animals in a period of one to two months.

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This condition, although in our view of a drastic nature, was agreed to, the opinion being held that if the vaccine would give even only a partial immunity in these circumstances it would probably confer a high degree of immunity against any form of natural infection.

**Virulence Tests.**

As the strains of tubercle bacilli to be used for the preparation of the test dose were freshly isolated and no information regarding their virulence was available, the following experiments were undertaken by us to test their virulence and afford some information as to dosage.

TEST 1.

A six months old calf was purchased from a tuberculin-tested herd. On February 2nd, 1932, it was injected intravenously with 100 milligrams (0.100 gram) of dry growth of tubercle bacilli grown on the surface of solidified egg medium (Petroff) and prepared by us in the manner described later. This calf died on February 22nd from acute generalised tuberculosis, 20 days after injection. A record of its temperatures is given :—

| 2/2 | 3/2 | 4/2 | 5/2 | 6/2 | 8/2 | 9/2 | 10/2 |
|---|---|---|---|---|---|---|---|
| 102.6 | 104.5 | 105.5 | 103.6 | 104 | 103.4 | 103.2 | 102.4 |
| 11/2 | 12/2 | 13/2 | 16/2 | 17/2 | 19/2 | 20/2 | 22/2 |
| 103.2 | 103.2 | 103.6 | 105.8 | 106 | 106 | 106 | calf dead |

TEST 2.

Calf No. D100 from the Control Group was transferred from the experimental farm to the Veterinary Research Laboratory.

It was injected intravenously on April 9th, 1932, with 50 milligrams (0.050 gram) of dry growth of tubercle bacilli grown on the surface of Petroff slopes. The calf died on April 27th from acute generalised tuberculosis, 19 days after injection. A record of its temperatures is given :—

| 10/4 | 11/4 | 12/4 | 13/4 | 14/4 | 15/4 | 16/4 | 17/4 | 18/4 |
|---|---|---|---|---|---|---|---|---|
| 104.8 | 102.8 | 104 | 103.4 | 103.8 | 104 | 104 | 103.8 | 104.5 |
| 19/4 | 20/4 | 21/4 | 22/4 | 23/4 | 25/4 | 26/4 | 27/4 | 28/4 |
| 104.5 | 104.4 | 103.4 | 103.5 | 104 | 104.4 | 105.4 | 104.4 | calf dead |

TEST 3.

Calf No. A2 from the Control Group was transferred from the experimental farm to the Veterinary Research Division. It was injected intravenously on April 28th, 1932, with 10 milligrams (0.010 gram) of dry growth of tubercle bacilli grown on the surface of Petroff slopes. This calf died on May 18th, 1932, from acute generalised tuberculosis, 18 days after injection. A record of its temperatures is given :—

| 29/4 | 30/4 | 1/5 | 3/5 | 4/5 | 5/5 | 6/5 |
|---|---|---|---|---|---|---|
| 102.6 | 102 | 102.8 | 103.4 | 104 | 104.2 | 104.2 |
| 7/5 | 8/5 | 10/5 | 11/5 | 13/5 | 14/5 | 18/5 |
| 104.5 | 103.8 | 104.2 | 105.8 | 107.2 | 105.8 | calf dead |

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These experiments, beyond indicating the virulence of the culture, did not afford precise information as to the dose which would kill unvaccinated animals in one to two months. It was decided, however, without further trial, that a dose of 2.5 milligrams (0.0025 gram) of dry growth of tubercle bacilli injected intravenously should be used as the test dose.

The cultures used for the test doses were isolated and prepared by us in the manner described below. They were young and actively growing and in no case more than one month old.

**Method of Preparation of Test Doses.**

The weights of growth of tubercle bacilli from the surface of solid egg media slopes (Petroff) as shown in the table, were emulsified in an agate mortar with normal saline and then shaken in a stoppered bottle with various sizes of glass beads until an even suspension was obtained. In all 0.625 gram of growth was suspended in 50 c.c. of normal saline.

Ten c.c. of this suspension was pipetted into a sterilised 500 c.c. glass-stoppered cylinder and normal saline added to the 500 c.c. mark. This represented 0.125 gram of growth of tubercle bacilli suspended in 500 c.c. normal saline. This suspension was distributed in 10 c.c. amounts in amber vaccine bottles fitted with rubber caps. Each 10 c.c. therefore contained 0.0025 gram of growth of tubercle bacilli, and as 0.001 gram of growth is generally accepted as containing approximately 40,000,000 tubercle bacilli, 0.0025 gram of growth would contain approximately 100,000,000 tubercle bacilli. This was the dose injected intravenously into each calf, vaccinated and unvaccinated, and will be referred to hereafter in this report as the test dose. The method of preparation may be open to the objection that it did not completely obviate the presence of aggregations of tubercle bacilli.

The measures described for the preparation of the test dose were adopted with a view to ensuring that each animal received an identical dose. It may be that more elaborate methods of preparation would have secured a finer state of division of the suspended growth of tubercle bacilli in the test dose. Within limits it is probable that the coarser the particles of tubercle bacilli suspended in the test dose the more difficult it might be for the defensive mechanism to eliminate the infection. We have, therefore, thought it desirable to detail our method of preparation as fully as possible.

The suspensions were prepared with careful aseptic precautions, the actual weighings and dilutions being done by one of us. Each culture before being used was examined microscopically and the purity of its growth checked.

With a view to making the test dose an exacting one, seven (7) different strains of bovine tubercle bacilli were used. These strains were isolated as follows :—

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| Strain | Date of Isolation | No. of Subculture | Source of Strain | Amount used grams |
|---|---|---|---|---|
| 2 | 16.2.31 | 10th | Milk (direct cultivation) | 0.100 |
| 3 | 10.2.31 | 9th | Milk (per guinea-pig) | 0.100 |
| Q.U.B. | 3.3.31 | 9th | Milk (per guinea-pig) | 0.025 |
| X | 3.6.31 | 9th | T.B. gland per guinea-pig | 0.100 |
| 5 | 4.4.31 | 8th | T.B. lung per guinea-pig | 0.100 |
| 6 | 15.4.31 | 9th | Milk (direct cultivation) | 0.100 |
| Bailie | 13.1.32 | 3rd | Milk (direct cultivation) | 0.100 |

The test doses were prepared immediately prior to injection, and each test dose was thoroughly shaken before aspiration into the syringe.

### Method of Administration of Test Dose.

The test dose (2.5 milligrams of growth of tubercle bacilli suspended in 10 c.c. normal saline) was injected by us into the jugular vein of each animal on June 6th, 1932, *i.e.*, approximately six months after vaccination.

The hypodermic needle was inserted into the jugular vein and the blood observed to flow freely, the syringe containing the test dose was connected to the needle and a drop of blood aspirated into the syringe. The test dose was then slowly injected and when about half the quantity had been injected a further drop of blood was aspirated to ensure that the needle was still in the vein. This operation was repeated when the injection had been completed and the blood aspirated returned to the jugular vein, so that there can be no doubt that the entire test dose was injected intravenously. Each animal was carefully checked off and identified before administering the test dose.

After injection of the test dose the animals were inspected daily and when possible their temperatures were taken. It was not possible in the case of some of the animals to take their temperatures from the beginning, as they were exceptionally wild and it was not considered desirable to disturb them unduly. They were allowed to continue out of doors.

### History of Animals Following the Injection of the Test Dose.

It is proposed to deal with the Control Group first and then Group IV, which, as mentioned, may be considered as varying little from the conditions of the Control Group. Group III, the group which received the " new " Simplified Vaccine, will then be dealt with.

Reports on Groups I, II and V are included in the Appendix.

About a year after the injection of the test dose the heifers in the various groups were separated from the bullocks and a bull was allowed to run with them.

All became pregnant with the exception of A25 (Group 3). The object of this was to determine the effect of pregnancy and the act of parturition on the resistance of the heifers to tuberculosis.

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**Control Group VI.—Unvaccinated.**

Nos. A6, A10, A16, A20, A23, A24 AND A28.

Two animals from this group, Nos. D100 and A2, were transferred to the laboratory for the virulence tests 2 and 3, as described above, so that seven animals remained in it at the time of injection of the test dose.

Following the injection of the test dose the control animals showed considerable variations in temperature until the tenth or eleventh day, when marked rises in all their temperatures were recorded. In the case of animals Nos. A16, A10, A20, A6 and A24, this rise of temperature was maintained with occasional fluctuations until death supervened. These five animals became emaciated and developed an incessant cough.

A16 died on July 1st, 1932, 25 days after injection of the test dose.

A10 died on July 5th, 1932, 29 days after injection of the test dose.

A20 died on July 10th, 1932, 34 days after injection of the test dose.

A6 died on July 28th, 1932, 52 days after injection of the test dose.

A24 died on August 18th, 1932, 73 days after injection of the test dose.

So that of the seven unvaccinated control calves, five died in an average period of 43 days after the injection of the test dose.

Post-mortem examination of all five animals showed acute generalised tuberculosis.

In animals Nos. A23 and A28 the febrile attack persisted until the thirty-third day when their temperatures approximated to normal. No noteworthy rise in temperature was shown afterwards. These two animals coughed considerably during the first month, but this symptom disappeared when their temperatures returned to normal. Both animals remained in good health until slaughtered.

No. A28 calved on May 4th, 1934, and suckled her calf. She was killed on November 2nd, 1934, 879 days after injection of the test dose.

No. A23 was killed on July 9th, 1934, 763 days after injection of the test dose.

Both animals were in good health and fat condition when slaughtered. In No. A23 numerous small calcified nodules (about the size of No. 3 shot) were found evenly distributed throughout the lung substance. Similar nodules were present in the bronchial, mediastinal, mesenteric, portal and hepatic glands. Traces of an old tuberculous pleurisy were noticed. In No. A28 the lung nodules were very much fewer in number and approximated to the size of small garden peas. Three the size of walnuts were found in the base of each lung, and on incision were found to contain a creamy-yellow pus-like substance. The bronchial and mediastinal glands were extensively affected. A small pin-head nodule was found in one mesenteric gland and a similar nodule was found in the hepatic lymphatic gland. One lobule in the left kidney showed lesions.

Inoculation of material from the lesions found in both animals proved the presence of viable tubercle bacilli, although these were not found on microscopical

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examination of slides prepared from the lesions in No. A28. Tubercle bacilli were found on the microscopical examination of slides prepared from the lesions in A23.

*Remarks.*—Both these unvaccinated animals, *viz.*, Nos. A23 and A28, possessed a very high degree of natural resistance to the intravenous injection of tubercle bacilli.

It is generally accepted that a small percentage of calves possess a high degree of natural resistance.

It should be mentioned that Nos. A6, A20 and A23 were submitted to the double intradermal tuberculin test on May 31st, June 2nd, June 3rd, 1932, a few days before the injection of the test dose, and all three animals passed.

**Group IV.**

The two animals in this group, Nos. A7 and A18, were inoculated with filtered extract of tuberculous lesions prepared in 1922. As stated previously, Mr. Spahlinger considered that the inoculum might have lost its sensitising properties with age. We were informed at the time that these two animals would probably not survive and might be expected to die before the controls.

The injection of this material was made by Mr. Spahlinger on December 2nd, 1931, and No. A18 received twice as much of the inoculum as No. A7.

In our view these two animals may be regarded as varying little from the conditions of the Control Group (unvaccinated).

These two animals passed the double intradermal tuberculin test in the first week of March, 1932. They were retested in May, 1932, and again passed. These particular tests were carried out on Mr. Spahlinger's instructions.

The test dose was injected on June 6th, 1932.

Following the injection of the test dose the temperatures of these two animals were taken daily and are recorded graphically in the Appendix. Both suffered a severe febrile reaction which persisted from the twenty-fourth to the forty-eighth hour, when the temperatures returned to normal.

On the ninth day after the injection of the test dose the temperatures commenced to rise and both animals suffered a severe febrile illness which persisted. No. A18 died on July 9th, 1932, thirty-three days after the administration of the test dose, and on post-mortem examination was found to be affected with acute generalised tuberculosis.

In No. A7 the febrile attack persisted for almost sixty days. The appearance of this animal on several occasions was suggestive of early death. It coughed incessantly and from its laboured breathing it was obvious that its lungs were seriously affected. The acute symptoms gradually disappeared and the case developed into one of chronic tuberculosis. A chronic cough was present and great respiratory distress was shown even when the animal was driven only a short distance. During June, 1934, its condition gradually became worse and it was slaughtered on July 11th, 1934, 765 days after the injection of the test dose.

Post-mortem examination showed generalised tuberculosis, practically every organ and gland in the body, with the exception of the lumbar group of lymphatic glands, being seriously affected. Although no nervous symptoms were shown during life, extensive tuberculosis of the central nervous system was found on post-mortem examination.

*Remarks.*—These two animals reacted to the test dose in a manner very similar to the controls (unvaccinated).

### Group III.

As mentioned earlier, there were eleven animals in Group III. These animals were vaccinated with the " New " Simplified dead vaccine, prepared according to the method described in the Addendum B.

The date of vaccination was December 2nd, 1931. This group was sub-divided into a number of smaller groups, according to the method of vaccination.

### Group III Sub-Divisions.

| Sub-Group | Method of Vaccination | Numbers of Calves |
|---|---|---|
| IIIA | Intravenous | A4, A22 and A25 (3 animals) (A25 received two doses of vaccine, one intravenously and one subcutaneously). |
| IIIB | Subcutaneous | A3, A9 and A30 (3 animals). |
| IIIC | Intramuscular | A5, A14 and A27 (3 animals). |
| IIID | Vaccine in olive oil, subcutaneous | A1 and A29 (2 animals). |

The test dose prepared, as described above, was injected by us on June 6th, 1932, approximately six months after vaccination. For convenience the animals will be reported on according to the sub-divisions in the group.

### Sub-Group IIIa.

(Nos. A4, A22, and A25.) Intravenous Vaccination.

The three calves in this group showed a marked rise in temperature following the injection of the test dose. An occasional cough was noticed. The temperatures fell gradually and after ten days had returned to normal: coughing became very infrequent and in about twenty-one days had disappeared. No. A4 lost some condition during this period, but when its temperature became normal it quickly recovered. It remained in good health until October, 1933, when early symptoms of derangement of the central nervous system were noticed. The illness was of a progressive nature and death occurred on February 5th, 1934, from pneumonia following tuberculous meningitis, 607 days after the injection of the test dose. As discussed later in this report, this animal suffered from parasitic pneumonia. It was recumbent for six weeks prior to death, hypostatic pneumonia supervening and being the actual cause of death. The pneumonic portions of the lungs were in a state of grey hepatisation and were extremely rich in acid-fast organisms (tubercle bacilli).

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This animal was severely affected with hoose, and on post-mortem examination the lungs were found to be heavily infested with hoose worms. This fact is recorded because it may have lowered the resistance to tuberculosis induced by the vaccination. The symptoms of meningitis did not appear until October, 1933, approximately 500 days after the injection of the test dose, and followed closely the severe attack of hoose mentioned.

No. A22 was killed on November 15th, 1934, 892 days after injection of the test dose.

No. A25 was killed on October 17th, 1934, 863 days after injection of the test dose.

These two animals were in good health and prime condition when slaughtered. Encapsulated caseous nodules were present in both animals. In No. A22 about fifteen nodules, which varied in size from peas to beans, were found in each lung. Encapsulated nodules were also present in the bronchial mediastinal, right renal and supramammary lymphatic glands, and in the right adrenal gland and kidney. None of these nodules appeared to be progressive in nature.

In A25 encapsulated nodules varying in size from sago grains to walnuts were present in the lungs. A creamy-yellow pus-like substance was present in the larger nodules. Small encapsulated caseous nodules were present in the bronchial and mediastinal and in two mesenteric lymphatic glands. None of these nodules appeared to be progressive in nature. Tubercle bacilli were not demonstrable on microscopical examination of smears and sections, but the inoculation of material from the nodules into guinea-pigs proved the presence of viable tubercle bacilli. No. A22 calved on May 10th, 1934, and suckled her calf.

### Sub-Group IIIb.

(Nos. A3, A9 and A30). Subcutaneous Vaccination.

The three calves in this group also showed an acute febrile attack following the injection of the test dose. Both No. A3 and A9 lost a good deal of condition, which they soon recovered when their temperatures returned to normal about the tenth day.

No. A3 was killed on October 12th, 1934, 858 days after the injection of the test dose.

No. A9 was killed on July 26th, 1934, 780 days after the injection of the test dose.

These two animals were in good health and fat condition when slaughtered.

In No. A3, two small encapsulated caseous nodules the size of sago grains were present in the lungs. A few similar nodules were present in the bronchial and mediastinal glands. A similar nodule was present in the right prescapular lymphatic gland. No other macroscopic evidence of tuberculosis was found.

In No. A9 numerous small pea-like nodules, the majority of which were calcified, were present in the lungs. A small nodule was present in the pleura.

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The mesenteric chain of glands was extensively affected, several of the glands approximating to the size of goose eggs and being caseous throughout.

Microscopical examination of smears and sections failed to show the presence of tubercle bacilli in the material from the nodules in No. A3. In the case of A9, a few acid-fast organisms were found in the nodules. Inoculation of the material from these animals into guinea-pigs proved the presence of viable tubercle bacilli.

No. A30 was killed on October 24th, 1934, 870 days after the injection of the test dose. This animal developed an attack of streptococcal mastitis in August, 1933, and appeared to recover from it, except that the quarter remained indurated. She calved on May 6th, 1934. Both hind quarters of the udder and right front quarter remained small and indurated after calving. Tuberculous mastitis was suspected, but no acid-fast organisms (tubercle bacilli) were detected on microscopical examination of the discharge until October 3rd, 1934, when after prolonged examination one organism only was found. Numerous lesions were found in this animal on post-mortem examination. The condition of the carcase was quite good.

### Sub-Group IIIc.

(Nos. A5, A14 and A27). Intramuscular Vaccination.

The three animals in this group also suffered an acute febrile attack which persisted for two or three days following the injection of the test dose. The temperatures had returned to normal on the seven or eighth day. No. A5 was very dull and became rather unthrifty-looking. It regained the lost condition when its temperature returned to normal. These animals were noticed coughing occasionally, but this symptom entirely disappeared in about one month. Their further history was uneventful.

No. A5 was slaughtered on October 9th, 1934, 855 days after the injection of the test dose.

No. A14 was slaughtered on November 6th, 1934, 883 days after the injection of the test dose.

No. A27 was slaughtered on November 13th, 1934, 890 days after the injection of the test dose.

These three animals were in good health and fat condition when slaughtered. In the case of No. A5, numerous small encapsulated caseous nodules were present in the lungs.

In No. A14 three small nodules were present in the left bronchial gland. The fourth sternal vertebra showed a yellowish soft centre which on biological examination was found to be tuberculous in nature.

In No. A27 about twenty small hard encapsulated nodules were found in the lungs and bronchial and mediastinal glands. Only one nodule was found in the mesenteric chain of glands. Similar nodules were found in the hepatic, right



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iliac and right lumbar lymphatic glands ; none of them appeared to be active or progressive in nature.

On miscroscopic examination of smears and sections, tubercle bacilli were not found, but their presence was proved by the inoculation of the material into guinea-pigs.

Nos. A14 and A27 calved on May 6th and 10th, 1934, respectively. Both suckled their calves.

### Sub-Group IIId.

(A1 AND A29). VACCINE IN OLIVE OIL (SUBCUTANEOUS).

The two animals in this group experienced an acute febrile attack following the injection of the test dose. Their temperatures returned to normal about the ninth or tenth day.

No. A29 lost condition during the first fourteen days. This was quickly regained. Very little coughing was noticed in these two animals and none after the first fourteen days. Their further history was uneventful and both animals were in good health and fat condition when slaughtered.

No. A1 was killed on October 11th, 1934, 857 days after the injection of the test dose.

No. A29 was killed on October 10th, 1934, 856 days after the injection of the test dose.

In No. A1 a few small encapsulated nodules were present in the lungs. Their contents were of a yellow cream-like nature. Small encapsulated nodules were present in the following lymphatic glands : bronchial, mediastinal, one mesenteric, portal, hepatic, renal, right prepectoral and right prescapular. Nodules were also present in the liver substance.

In No. A29 a few nodules which varied in size from a pea to a pigeon's egg were present in the lungs. The nodules contained a stiff, creamy, pus-like substance. The bronchial and mediastinal glands were extensively affected. The right prescapular and the right parotid lymphatic glands were also affected.

The inoculation of material from the nodules proved the presence of viable tubercle bacilli, but these were not demonstrable on microscopical examination of sections. The disease present in these two animals was of a non-progressive character.

### Summary.

In the Control Group (unvaccinated) there were seven animals. Five of these animals died in an average time of forty-three days following the injection of the test dose. Post-mortem examination showed each animal to be affected with acute generalised tuberculosis. The two control animals which survived, *viz.*, Nos. A23 and A28, both experienced an acute febrile attack which lasted for about thirty days, following the injection of the test dose. Both animals recovered from this attack. Tuberculosis of a non-progressive nature was found on post-

mortem examination of both animals, indicating that these two animals possessed a high degree of natural resistance.

In Group IV, which, for the reasons mentioned earlier, has been considered along with the Control Group, there were two animals. One of these animals died in 34 days following the injection of the test dose, and post-mortem examination showed it to be affected with acute generalised tuberculosis. The other animal became acutely ill following the injection of the test dose and developed into a definite chronic cases of tuberculosis. It was slaughtered for humanitarian reasons 765 days after the administration of the test dose. Post-mortem examination showed it to be very severely affected with generalised and progressive tuberculosis.

There were eleven animals in Group III (New Vaccine Group). All resisted the injection of the test dose in a very similar manner. One animal, No. A4, later developed tuberculous meningitis and died from a hypostatic pneumonia 607 days after receiving the test dose. This animal was seriously affected with hoose and on post-mortem examination the lungs were found to be heavily infested with hoose worms.

No. A30 was found on post-mortem examination to have a tuberculous udder and fairly widely disseminated lesions of tuberculosis. It was in quite good condition when slaughtered, 870 days after the injection of the test dose.

With these two exceptions (Nos. A4 and A30), the carcases in the vaccinated group were considered to be fit for human consumption by the Belfast City Veterinarian (Mr. A. McLean, M.R.C.V.S., D.V.H.), and his opinion, which agreed with ours, was that the lesions present were of a non-progressive nature.

Considering these facts it must be concluded that a high degree of resistance or immunity against a massive dose of tubercle bacilli injected intravenously was conferred on the vaccinated animals.

An interesting point which we should like to record is that calcification was not a pronounced feature of the nodules found in the vaccinated animals, whereas in the two surviving control animals calcification was very evident. The majority of the lung nodules in the vaccinated animals had a well-developed fibrous capsule containing a yellowish oily pus of the consistency of whipped cream. Other lung nodules were dry and very firm, shelling like peas or pearls from their capsules, but the majority of these were not calcified. This peculiarity of the nodules found in the vaccinated group as compared with the control animals points to the fact that it may be associated in some manner with the resistance induced by the vaccination. These nodules on palpation in the lung substance felt like very firm small peas, so firm indeed that the presence of the oily yellow pus was not suspected. The general appearance of the nodules and their distribution suggested to us that they were the direct result of the aggregations of bacilli composing the test dose being arrested in the various sites. The route of injection of the test dose was the jugular vein, and it is therefore to be expected that the



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greatest number of nodules would be found in the lungs and in the periphery of the lungs furthest away from the main force of the blood stream. The post-mortem examination revealed that this was so. Not all the tubercle bacilli were arrested in the lungs, as study of the post-mortem reports will show.

Emulsions were prepared from negative glands, etc. (*i.e.*, glands in which no visible evidence of disease was present) and injected into guinea pigs, in all cases with negative results.

Microscopical examination of smears or sections prepared from the nodules (with the exception of those from Nos. A4, A9 and A30) failed to show acid-fast organisms, the presence of these in the nodules only being proved on inoculation into guinea-pigs.

The vaccine proved most successful in Sub-Group IIIC. These three animals were injected intramuscularly. This method of applying the " New " Simplified Vaccine deserves special consideration in future work.

The vaccinated animals all responded very similarly to the injection of the test dose. They suffered a severe attack for two or three days, after which their temperatures dropped to, and remained, normal.

The control animals showed considerable fluctuations in temperature as compared with the vaccinated animals and were recording high temperatures when those of the vaccinated animals had returned to normal. This febrile attack terminated fatally in all the controls with the exception of Nos. A23 and A28.

During the course of the experiment it must be borne in mind that in addition to the intravenous injection of the massive test dose all the surviving animals were subject to intensive natural infection through the presence amongst them of animals which were suffering from tuberculosis. Moreover, various types of parasitic infection, such as hoose worms, liver fluke and intestinal worms, were present, all of which would normally tend to lower the vitality of the animals and to this extent facilitate the spread of any progressive type of tuberculosis.

## Conclusions.

We consider that the injection of the " New " Simplified Dead Vaccine prepared by Mr. H. Spahlinger conferred a high degree of resistance against a massive intravenous injection of tubercle bacilli. The intramuscular method of vaccination in this experiment has given the most satisfactory results.

The scientific workers whose names are appended to the report are : H. G. Lamont, M.Sc., M.R.C.V.S. ; W. R. Kerr, M.R.C.V.S., D.V.S.M. ; P. L. Shanks, B.Sc. Agric., M.R.C.V.S. ; of the Veterinary Research Division, Ministry of Agriculture, Northern Ireland.

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# HARPER ADAMS LAYING TRIALS MORTALITY RECORDS.

By K. D. DOWNHAM, B.V.Sc., M.R.C.V.S., D.V.H.

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ONE of the advantages of a large laying trial such as the one which has been conducted for many years at this College, is that it affords those interested in the study of poultry diseases a unique opportunity for making observations upon a number of pathological conditions from which the present-day fowl suffers.

At the Harper Adams Egg-Laying Trials there over 2,000 birds which are under the same management, fed upon the same diet and housed under similar conditions. It has been my privilege to conduct post-mortem and other examinations upon birds which have died at these trials for the last four years. I am now faced with the fact that although the 1934–35 Egg-Laying Trials have five more weeks until their completion, the mortality is at present 18.5 per cent., the highest figure yet recorded at these trials.

The average mortality at Harper Adams Egg-Laying Trials for the last twelve years in three-year periods has shown a gradual rise in percentage mortality during the period: 1923–1925, 5.2 per cent.; 1925–1928, 6.4 per cent.; 1928–1931, 8.9 per cent.; 1931–1934, 15.6 per cent. It may be poor consolation to reflect that the mortality at several other trials is higher than our own. A comparison with some American laying trials is certainly enlightening, if not encouraging.

Barger and Card[1] (1935), writing on this subject in "Diseases and Parasites of Poultry," state that Dunnicliff (1913) recorded an average mortality of 6.3 per cent. from an analysis of ten years' egg-laying tests in New South Wales from a total of 5,448 hens. Card and Kirkpatrick[2] (1919) recorded 15 per cent. mortality at the Seventh Storrs competition, where 1,000 pullets were entered. Anderson[3] (1928) reported an average mortality of 25.4 per cent. for the first five years of the New York State Egg-Laying Contest. In the sixth year, 28 per cent. among White Leghorns and 45.6 per cent. among Rhode Island Reds, these being the only breeds represented by 200 or more pullets. Stafseth and Weisnor[4] (1931) reported the death loss among 10,000 pullets entered in eight successive laying contests in Michigan and showed that it averaged 19 per cent. a year. Alder[5] (1934) gives the mortality percentages in each of seven successive contests in Utah as 13, 35, 27, 18, 20 and 58 respectively. The excessively high figure in the last year is attributed in part to an outbreak of infectious laryngo-tracheitis shortly after the opening of the contest.

It has been found that the mortality-rate at laying trials keeps about the same level as the mortality-rate on commercial poultry farms. Kennard[6] records

some alarming figures of the pullet mortality on commercial farms in several States in America; his figure of over 50 per cent. is very amazing. Other American figures of mortality upon commercial poultry farms are recorded by Bayer and Card (1935) thus:

Scudder and co-workers[7] (1931) found an average death loss amounting to 13 per cent. among flocks totalling 271,337 hens in Oregon during the three-year period 1926–1928. Misner[8] (1932) found a mortality of 27 per cent. on 108 New York State poultry farms during the year 1930–1931. The average number of hens per farm in this group was 1,454. Thomas and Clawson[9] (1933) reported a mortality of 20 per cent. on 315,577 Leghorn hens kept in commercial flocks of about 1,000 each in Utah during the three years 1929–1931. Jull[10] (1934) cites a report of the death loss on 126 farms in San Bernardino county, California, from 1928 to 1933. The average number of hens per farm was 956, and the average mortality by years was 19, 24, 27, 37, 36 and 39 per cent. It is a fairly common experience for me to receive birds for examination with a statement by the owner that his flock mortality to date has been over 50 per cent.

In my opinion laying-trial mortality is a reflection of the disease situation in the poultry industry as a whole, and I consider the losses are far too many, and a great deal more might be done to reduce them both at laying trials and on poultry farms in this country. An analysis of the mortality at the Harper Adams Egg-Laying Trials for the past year, 1934–1935, from October to August 13th, is as follows:

ANALYSIS OF HARPER ADAMS EGG-LAYING TRIALS.—MORTALITY RECORDS UPON 380 BIRDS.

(*Period October 16th, 1934, to August 13th, 1935.*)

| | Total deaths | |
|---|---|---|
| Diseases caused by parasitic worms | 118 | Capillaria, 47; Ascaridia, 6; heterakis, 3; davainea, 46; davainea and capillaria, 15; davinea and ascaridia, 1. (*See* text below.) |
| Diseases of reproductive organs. | 103 | Peritonitis due to ruptured egg in abdominal cavity and oviductitis (14 tumours of ovary recorded under tumours). |
| Diseases of the digestive system. | 39 | Impaction of the gizzard, 16; enteritis (inflammation of the inner lining of the bowels), 14 (seven had also suffered from nephritis). Fatty degeneration of the liver and other visceral organs, 7; vent gleet and peritonitis, 2. |
| Diseases of the kidneys. | 25 | Nephritis with enteritis as primary cause, 15; Nephritis accompanied by visceral gout, 7; four birds exhibited paralysis, one bird blindness. Chronic nephritis with ascites (dropsy), 2. Nephritis with paralysis, 1. |
| Diseases of the respiratory system. | 24 | Broncho-pneumonia, 13; pneumonia, 5; tracheitis, 4; empyæmia (abscess of lungs), 2. |

| | Total deaths. | |
|---|---|---|
| Tumours | 25 | Tumours of the ovary, 14; including: lymphomata, 5; cystic tumours, 4; tumour of ovarian blood vessels, 1; tumours of ovary, pancreas and intestines, 1; tumours of ovary, liver and kidneys, 1; tumours of ovary and peritoneum, 1; tumours of ovary and gizzard, 1. Tumours of liver alone: lymphomata of liver, 2; hæmangioma of liver, 1; hæmangioma of liver and leg, 1. Tumours of liver and other organs: lymphomata of liver and kidneys, 1; lymphomata of liver and spleen, 1; lymphomata of liver (multiple), 1; lymphomata of liver and intestines, 1. Tumours of other organs: tumour of lumbar vertebræ (back), 1; tumour of lung, 1; tumour of intestines, 1. |
| Leucosis. | 15 | Chiefly affecting liver, spleen and kidneys, 7; chiefly affecting liver and kidneys, 6; chiefly affecting liver, 2. All these birds were in different pens. One or two exhibited symptoms of paralysis, particularly when the kidney was the seat of extensive lesions. |
| Avian tuberculosis. | 11 | Four of this number were killed because they had reacted to the tuberculin test, and all those birds showed lesions of tuberculosis in the liver and spleen. The eleven deaths occurred in five pens: in one pen four birds died; in three pens two birds died in each, and in one pen one bird died. All the deaths occurred in the newer section of the trials. In no case had the pens which held these birds contained birds which had died from tuberculosis during the past four years, but two of the three infected pens were next to pens which had held tuberculous birds during the four previous years, and two pens infected this year adjoined one another. It would help to reduce the mortality if all birds were tuberculin tested before coming to the trials, and only those that passed the test admitted. |
| Diseases of the circulatory system | 8 | Four died from rupture of hepatic blood vessel; four died from rupture of an abdominal blood vessel, probably due to straining to pass a large-sized egg. |
| Peritonitis (inflammation of the membranes surrounding and supporting the bowel walls) | 7 | Four eversion of the intestines and/or oviduct; one impaction of the intestines and ruptured intestine; two peritoneal vegetations, pre-tumourous state. |
| Coccidiosis. | 5 | These were all of the chronic type affecting the duodenum and small intestine. The low number of birds dying at the trials from duodenal coccidiosis indicates that the disease in commercial flocks chiefly results from conditions of overcrowding. |

From this analysis it will be seen that for the first time at these trials the deaths from intestinal worms head the list.

When we consider the age incidence of disease caused by round and tape worms it is to be expected that deaths from these causes should occur. A proportion of the birds arrive at the trials already infested with worms; hundreds of eggs are passed on the ground, these become infective, the birds pick up large numbers of infective eggs, and as the fowls are reduced in resistance because they are producing large numbers of eggs, the dice is loaded against them, the

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parasite wins, and the bird begins to go down hill ; by the time they die many are skeletons and very heavily infested, and trouble is laid up for future birds.

I compared a number of pens which had been used in a section of the trials since they started at the College with another section which had been added some twelve years later. I found in the new section, comprising 789 birds, the deaths from intestinal worms was 5.2 per cent., and in the old section, which housed 519 birds, the mortality due to worms was 6.7 per cent. The percentage death-rate from intestinal worms upon the total number of birds entered being 5.7 per cent. This shows 1.5 per cent. increase in mortality on 6 per cent.

You will observe that I have not recorded any deaths at the trials from fowl paralysis (neuro-lymphamatosis). I hold the opinion that paralytic symptoms in birds supported by lymphoid or other cells in the nerve sheaths and viscera at post-mortem is a pathological condition resulting from toxins (bacterial poisons) gaining an entrance to the fowl's system by means of the damaged mucous membrane of the alimentary canal.[11] It is possible in a certain proportion of cases that a filterable virus may bring about the condition, but in the majority of cases toxins produced by bacteria are the activating agent.

Four years ago I stated that I considered the cause of fowl paralysis was closely associated with coccidiosis and intestinal worms. I still consider they are the conditions which most commonly prepare the way for the infective agent to get into the blood stream and cause paralytic symptoms and changes in the blood cells produced by the bird. In all my observations upon this disease the one constant factor has been the evidence of enteritis (inflammation of the inner lining of the intestines). This observation has been confirmed by Emmel,[12] who has shown that enteritis is a predisposing factor in an outbreak of fowl paralysis and that it furnishes an avenue for the primary causal agent. Emmel[13] found that it was possible to produce fowl paralysis by giving birds which had been artificially and naturally exposed to intestinal parasites, and thus given an opportunity for chronic enteritis to develop, organisms of the para-typhoid and typhoid group of bacteria by feeding. When these organisms were given to parasite-free birds (with no enteritis) symptoms of fowl paralysis failed to appear. I consider this is a most valuable contribution to the study of fowl paralysis. In my opinion he has arrived nearer to the truth about the cause of a number of conditions which are troubling the poultry industry all over the world at the present time than most other workers.

Coccidiosis and intestinal worms are to my mind the chief predisposing causes of fowl paralysis, leucosis and tumours in fowls. I consider that a further study of this group of conditions might very easily not only reduce the mortality rate upon laying trials and upon poultry farms in this country, but might very well throw a great deal of light upon the cause and prevention of tumours in human beings.

It will be seen that the majority of losses at Harper Adams Laying Trials at present come under the group represented by parasitic diseases, leucosis,

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tumours and diseases of the digestive system with enteritis; concentration of attention to the causes of these troubles will reduce the losses enormously. I consider that laying-trial mortality would be greatly reduced if all birds before admission to the trials were blood tested for the presence of B.W.D., tuberculin tested, and only non-reactors admitted to the test and vaccinated against fowl pox. Alternative runs should be provided; isolation pens and houses set up in a separate compound away from the trials would also help to reduce the losses. I consider the object of laying trials should be altered; their aim should be to bring to the fore breeding stocks which have a low mortality record, produce a good average number, but not an abnormally high number, of average-sized eggs, and they should be conducted upon an average group of birds selected by a disinterested person from breeders' stock. Progeny tests should be arranged upon the stock resulting from these birds.

The most important problem, to my mind, both for laying trials and for the poultry industry, is the control of disease, and it is surprising that the poultry industry does not give more financial support to the control of poultry diseases. I consider that Chairs or Readerships in Poultry Disease Control should be established at suitable universities or colleages. Courses of post-graduate instruction in poultry diseases should be organised for veterinary surgeons. Greater facilities should be offered for poultry instructors and others to obtain a knowledge of disease control, and research into the most important disease problems should be organised under field conditions which exist to-day on the ordinary poultry farms. Co-operation between breeders, veterinary, medical and nutritional workers in the field of poultry science is essential. It is to be hoped that greater facilities will be arranged for all those people to get together for the well-being of the poultry industry.

REFERENCES.

[1] " Diseases and Parasites of Poultry," 1935.
[2] " Egg-laying Contests," *Storrs Agr. Exp. Sta. Bul.*, 100, 1–71, 1919.
[3] " Report of the New York State Egg-laying Contest," Nov. 1st, 1926, to Oct. 23rd, 1927. Issued by State Inst. of Applied Agr., Farmingdale, N.Y.
[4] " Causes of Mortality in Laying Hens," *Michigan Quart. Bul.*, 13, 153–157, 1931.
[5] " Results of Seven Years' Egg-Laying Contests," *Utah Agr. Exp. Sta. Bul.*, 248, 1–28, 1934.
[6] *Bul. Ohio Exp. Sta.*, Woos., Ohio, 1932.
[7] " Cost and Efficiency in Commercial Egg Production in Oregon," *Oregon Agr. Exp. Sta. Bul.*, 287, 1–79, 1931.
[8] " Economic Studies of Poultry Farming in New York, IV." *Cornell Agr. Exp. Sta. Mim. Repts.*, 1932.
[9] " Economic Factors Affecting Poultry Production and Marketing in Utah," *Utah Agr. Exp. Sta. Bul.*, 244, 1–82, 1933.
[10] " The Mortality Problem in Poultry." A reprint from the July and August, 1934, issues of the *U.S. Egg and Poultry Magazine*, 11 pp., 1934.
[11] Observations upon Neuritis in Fowls," K. D. Downham and C. Crompton, *Vet. Journal*, Vol. xc, 1934, pp. 505–508.
[12] " The Ætiology of Fowl Paralysis, Leucosis and Allied Conditions in the Fowl," *Journal Amer. Vet. Med. Ass.*, Vol. 86, No. 3, pp. 419–423, March, 1935.
[13] " The Ætiology of Fowl Paralysis, Leucosis and Allied Conditions in the Fowl," *Journal Amer. Vet. Med. Ass.*, Vol. 86, No. 3, pp. 419–423, March, 1935.

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# CONTAGIOUS PLEURO-PNEUMONIA OF CATTLE.

By HUBERT M. WEBB, M.R.C.V.S.

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CONTAGIOUS pleuro-pneumonia, or lung sickness, was introduced into the Bechuanaland Protectorate after the outbreak of rinderpest in 1896 with transport oxen. After the Boer War it was well established, more especially in the northern area, the Bamangwato reserve or Khama's country. In the southern Protectorate the efforts of the Chief Veterinary Officer, Mr. W. H. Chase, C.B.E., F.R.C.V.S., were successful in the combating of lung sickness several years before this happy result was achieved in the northern territory. It was not until about 1929 that the latter area was considered entirely free of lung sickness.

The difficulties that the C.V.O. had to content with in the north were enormous —passive opposition from Chief Khama and his people was the most serious. To this may be added lack of funds and adequate staff to patrol and inspect the many scattered cattle posts. It must be borne in mind that the Bechuanaland Protectorate comprises an area of 275,000 sq. miles, most of which is desert with no water or roads. When serious outbreaks occurred they could only be dealt with spasmodically.

The system of animal husbandry adopted by the Bamangwato natives also placed great difficulties in the way of dealing with a contagious disease like lung sickness. The majority of native cattle owners reside in their central town of Serowe, and many of the rich ones have cattle posts, in charge of Masarwe (poor natives who own few cattle and live by herding those of others, and hunting), scattered over a vast area of more or less sparsely populated country where there were then only a few waggon tracks, through more or less dense bush, to serve as roads. The natives, always anti-progressive, were definitely against the making of proper roads. From this it will be seen that control of movements of cattle, so necessary to effectively deal with a disease like lung sickness, was quite impossible. An army of police, had such existed, would not have been able to prevent ilicit movements from infected herds.

When I joined the Bechuanaland Protectorate Government, under Mr. Chase, in 1925, the usual mode of getting about the country was mule cart or Scotch cart and oxen, and horse for the longer and rougher journeys into the interior. In the latter twenty miles per day was fast travelling, which could only be kept up temporarily. An outbreak of lung sickness was seldom discovered till many deaths had taken place and infection was well established in the herds, the Masarwe in charge only reporting to the owners when several cattle were dead; and he again took his time before going to investigate and report to the Chief and the Government. This is merely related to show the facilities lung sickness had for spreading in Bechuanaland.

The method adopted to deal with outbreaks of lung sickness was first careful examination of the herd to detect all animals showing suspicious symptoms;

these were at once destroyed, with a quarter compensation if the disease was confirmed on post-mortem, and half compensation if no lesions were found. This is absolutely necessary to check spread of infection in the herd. The infected herds were isolated and quarantined as far as was possible, and no movements of cattle from this area were allowed for at least three months after all the cattle had been inoculated and there was no sign of further infection. This was followed as soon as possible, when suitable virus was obtained, by the inoculation of all contacts.

Pleuro-pneumonia is an insidious and slow-spreading disease requiring close actual contact, as would occur when cattle are kraaled at night before infection takes place. Even then all cattle do not become at once infected, showing that some preparatory change probably has to take place in the epithelium lining smaller bronchi and air cells. The inoculation period may be anything from three to six weeks to three months.

*Collection of Virus for Inoculation.*—A well-advanced case is selected, killed and well bled. The skin is removed, the thoracic cavity being carefully opened by the removal of the sternum. This must be done as aseptically as possible in the field ; no blood or other matter being allowed to fall into the cavity. If a favourable case has been selected, a variable amount of fluid from a bottle or two up to as much as eight or ten bottles may be found. This should be removed aseptically, a small cup being about the handiest for the purpose. Only clear amber-coloured fluid—not blood-stained or muddy—should be collected, and this should be strained into clean bottles, and 10 per cent. glycerine added. This should be allowed to stand in a cool, dark place for twenty-four hours ; it is then ready for use. Some operators remove the lungs carefully and lay them on a clean table. A small incision is made into the interlobar septa and the virus which exudes is collected with a clean spoon into bottles as before. Virus will keep for about ten days if stored in a cool place. The best plan is to bury the bottle in the shade under a tree and keep the place wet and covered with grass.

It frequently happens that several cattle have to be killed before one is found with any quantity of virus, these are the so-called dry cases of lung sickness.

In 1925, at Palapye Road, great difficulty was experienced in getting sufficient virus for the many outbreaks then prevalent. The method was then adopted of inoculating a calf about five months old in two or three places in the dewlap with virus. When the swelling reached its height, about the eighth day or later, sweating of the swelling was a favourable sign, this appears as drops of yellow fluid on the hairs. The calf is killed and bled when the swelling appears to be at its height. The skin over the swelling is carefully removed, small incisions forming pockets made into the swelling, and the exuding virus collected with a spoon. If often happens that very little or no suitable fluid, which must be clear and amber-coloured, is found. This is the drawback of this method. The original natural virus should not be subinoculated through more than two calves, otherwise it loses its potency and may fail to give immunity. It must be remembered that

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the Bamangwato cattle had a strong natural acquired immunity, and weak virus was useless for inoculation.

*Method of Inoculation.*—A strong crush capable of holding from ten to fifteen cattle ; this should not be more than 3 feet wide at the top and 2 feet at the bottom. The cattle must be packed into the crush tight with heads one way and tails the other. While this is being done care must be taken that the tail is not injured by being pulled or twisted, as natives are likely to do when getting animals into a crush. If this happens it may lead to a rapid extension of the infection up the tail after the inoculation, with loss of tail and perhaps the animal, should the swelling extend into the body. After the cattle have been packed into the crush the hair of the brush is clipped short and with strong syringe and needle of 10 c.c., about $\frac{1}{4}$ c.c. of virus is injected as near the tip of the tail as possible, care being taken not to injure the tail during the operation.

For the after-treatment of inoculated cattle it is necessary to have three or four firing irons made of $\frac{1}{2}$ to $\frac{3}{4}$ inch round iron and curved in a half-moon for about two inches at one end so that the curve fits conveniently round the tail. These are used for firing a ring round the tail in cases where the swelling shows signs of spreading rapidly upwards. If this upward extension of the swelling is not checked in time it probably means the loss of the beast from extension into the pelvic cavity.

The cattle should be kraaled at night and carefully examined by putting them through the crush from about the fifth day onwards. Favourable cases, where virus has been carefully selected and inoculation well done, develop a small swelling which often has a beady exudate of yellow fluid on the hair. This subsides in about two weeks. Should the swelling reach the size of an egg and appear to be spreading upwards, a ring must be seared round the tail at once, about half-way up or higher, to check the upward extension of the virus. Sometimes this fails and the glands at the root of the tail swell and suppurate and have to be lanced. The making of wounds is to be avoided if possible owing to the danger of infection with screw worm, but a ring seared round the glands with the curved iron sometimes helps to check the extension of the virus into the pelvis.

During the warm weather considerable trouble is caused through tails that are badly infected dropping off, also the swollen glands bursting, leaving open wounds which quickly become infected with screw worm. These wounds must be carefully dressed and the worms scraped out. One of the best things for killing the worms is a little petrol applied direct with a feather, the wound being afterwards dressed with Stockholm tar, which is one of the best things for keeping flies off. After a month, if animals are recovered, a second inoculation is given in the same way. This insures that any animals that did not react to first inoculation for some unknown reason will not be missed.

In Bechuanaland many cattle died through the carelessness of native herds in losing the cattle in the bush, with the result that they received no after-treatment, as is so necessary to check the swellings. This is almost unavoidable in a vast

bush country where cattle are mostly looked after by servants who are not the owners.

In 1926, an outbreak of lung sickness occurred to the west of Andara along the Okavonga River in the Caprivi Strip, which was then under Bechuanaland administration. This outbreak being an isolated one in the territory which had always been free from lung sickness, was at once dealt with by the slaughter of the few small infected herds. This outbreak was due to the movement of cattle from the extreme north of South-West Africa along the Okavonga River by Mumpukushu natives—a wild tribe living along the river. When I visited this part in 1926, lung sickness was seen at one or two villages before the Nyangana Mission was reached, which is about 40 miles west of the Bechuanaland border. No action was taken by the South-West authorities, as this part was completely separated from the Grootfontein farming area by over a hundred miles of desert in which there were only a few wandering Bushmen. When this area was again visited a year later there were practically no cattle left at any of the numerous villages along the Okavonga.

Another outbreak in 1927, further down the Okavonga on the N'Gamiland border, was dealt with in the same way with successful results. The source of infection probably came from South-West Africa or Angola. Many of the natives inhabiting this part are nomadic and have been in the habit of wandering about for years past. When these cattle were killed a few lungers were found which otherwise appeared to be in perfect health. Had this outbreak been allowed to get established in the vast herds of N'Gamiland, slaughter would have been out of the question, and, owing to the physical difficulties encountered in that country, lung sickness would have probably become endemic for many years, as it was in the Bamangwato country, and also as it is in Barotseland to-day.

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# A NOTE ON THE TREATMENT OF CANINE BABESIASIS.

**By J. CARMICHAEL, B.Sc., M.R.C.V.S., Dip. Bact. Lond.**

*Veterinary Laboratory, Uganda.*

TICK fever caused by *Babesia canis* is without doubt the commonest disease of domestic dogs in Tropical Africa. This particularly applies to those of European breeds. Various drugs have from time to time been employed in the treatment of this condition. Nuttall and Hadwen (1909) were the first to record the successful treatment of canine piroplasmosis with Trypanblau. Later the same authors (1909) showed that this drug will prevent the development of the parasite and, further, when given by the mouth, is ineffective.

Many drugs have been tried since then, but at the present time opinions are divided between Trypanblau and Stovarsol as to which is the more efficient treatment. In my hands Stovarsol has rarely been effective *per se*, but it is a

useful adjunct to other treatment. Trypanblau has many disadvantages. It is not a pleasant drug to work with owing to its staining properties. The curative dose is a large one and when given subcutaneously abscess formation, even under ideal conditions, is difficult to avoid. The convalescent period is long and the drug seems to have a marked depressant effect on the heart. Relapses are not infrequent.

Recently I have used a preparation manufactured by Bayer called " Akiron " (lately renamed " Acaprin ") with great success. As mentioned by Harvey (1935) in a paper to the Annual Congress of the National Veterinary Medical Association, Kikuth first recognised its specific effect on *Babesia canis* infection in the dog. This preparation is a urea derivative and is sent out in 6 c.c. ampoules of a water-clear, yellow, 5 per cent. sterile solution. The dose used is 1 mg. per kilo bodyweight, *i.e.*, 0.02 c.c. of the 5 per cent. solution. It is given intravenously with a 1 c.c. syringe, the drug being diluted up to this amount with sterile normal saline. Immediately following the injection the dog usually vomits and passes fæces, but is otherwise not inconvenienced. However, the dose should be carefully computed according to the weight of the patient. After twenty-four hours the temperature is usually down and the blood free from parasites. The patient should be kept quiet for three to four days, and nourishment should be given in the form of milk, egg and milk, etc. After this period normal exercise and diet can be resumed. In cases of severe anæmia a course of Stovarsol, gr. 4, and Blaud's pill, gr. 5, can be given according to the size of the dog.

### Cases Treated.

Without going into the details of individual dogs, it will suffice to record that during the last eight months I have treated twenty-four consecutive cases, the average dose being 0.2 c.c. The infections varied from the usual acute, early, primary infection to advanced cases showing very severe anæmic changes, jaundice and collapse. Two cases were of a chronic nature with severe anæmia and cachexia. Both of these had been treated with Trypanblau on one or more occasions. In all cases there was marked improvement after twenty-four hours followed by an uninterrupted recovery. In no cases have relapses occurred. One case, my own dog, was treated in March, and again in August, but this was undoubtedly a reinfection. It would appear that at last we have got a really satisfactory treatment for tick fever in dogs in the tropics, and I would commend its use to members of the profession who have not yet tried it.

REFERENCES.

Harvey, F. T (1935) : " Some Aspects of Redwater in Cattle," N.V.M.A., 53rd Annual Congress.

Nuttall, G. H. F., and Hadwen, S. (1909) : The Successful Drug Treatment of Canine Piroplasmosis, together with Observations upon the Effect of Drugs on Piroplasma Canis," *Parasitology*, ii, 156–191.

Nuttall, G. H. F. and Hadwen, S. (1909): " Further Experiments upon the Drug Treatment of Canine Piroplasmosis," *ibid.*, Vol. ii, 229–235.

# A VETERINARY MOTOR-TOUR IN EUROPE.

By C. W. OTTAWAY, M.R.C.V.S.

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THE following article is an attempt to describe briefly how a very pleasant holiday was combined with visits to six Continental Veterinary Colleges, where much was learnt of their equipment and methods. I was travelling with my brother, who as a teacher of biology also found much to interest him. We shipped, by the Townsend Ferry, one of the new Morris Eight cars, which, by the way, is most efficient and cheap, and this little car did 2,500 miles in four weeks, giving us no trouble whatever.

From Calais we made straight across France to Berne, arriving here, a matter of 550 miles, in two days. The Tierspital of Berne has been fully described by Mr. Henry Taylor in the April, 1935, issue of THE VETERINARY JOURNAL. I noted the limb-dissecting tables illustrated in this article, and, conducted by Dr. Hauser, paid special attention to the Anatomy Department, where the courses are combined with histology and embryology.

Zurich was the next stop, and instead of going direct we chose to go the long way over the Grimsel and Furka Passes, cooling the radiator by the careful injection of snow, inspecting the Rhone Glacier, and getting a glimpse of the beauties of the Bernese Oberland.

At Zurich, Professor Frei, who speaks excellent English, made us very welcome, and after taking us round the College showed us the special laboratories in which he is now doing research work on anaerobic bacteria and applied physiology. Professor Seiferle was in charge of the Anatomy Department, and prominent features of his museum were topographical sections and embryological models which could be taken to pieces.

We left Switzerland with 60 centimes and just enough petrol to get us to Ulm, the first town with a bank that would change our German *reisechecks*. Space does not allow a description of the fine old town of Nürnberg, or the other features of our journey to Leipzig.

Here at Leipzig was the finest veterinary institution that I encountered, the buildings being planned and the work organised with typical German efficiency. Every department was well equipped, and the work of Dr. Ackernecht and his technician, Hertzwog, is justly world-famous in all medical circles; some of his specimens, prepared by the Spälterholtz method, being a delight to the eye of the true student. The photographs reproduced in this issue give an excellent idea of the spaciousness of the rooms and the high standard of architecture which was evident throughout the college. I was struck also with the good lighting, furniture and general details of equipment.

In Berlin it was the Physiology Department that impressed me greatly with its elaborate and various apparatus, some of which is made in workshops attached to the department. Unfortunately many of the staff were away on vacation,

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but I was able to see the rare specimens of the three-toed horse found in America. A week-end in Berlin enabled us to see the new wireless tower and gardens, and the beauties of Potsdam. A visit to the Wannsee, with its bathing and athletics, gave us some idea of the physical fitness of the New Germany. From Berlin to Hanover, from the point of view of motoring, the roads were bad and the country uninteresting.

The Hanover College, one of the best in Germany, possesses dignified buildings amid well-kept gardens. I saw Professor Meissner, the Rektor, who was kind enough to grant me every facility. In my tour of the institutes I could not help admiring the regal council room and large modern library. The anatomical museum was well stocked and also contained specimens of natural history interest, including the enormous dried and inflated intestines of an elephant. The small animal clinic contained interesting features, including separate kennels for medical pre- and post-operative cases.

We continued our journey through Cologne into Belgium, visited the Exhibition in Brussels, and arrived eventually at Paris. Here, in the suburb of Alfort, is the headquarters of French veterinary science. This large school contains many specimens and apparatus which we had seen elsewhere, and which were exceedingly good. One striking feature was the new canine surgical clinic, which was self-contained, possessing its own consulting room, pharmacy, X-ray department, kitchen and baths.

Looking at the tour as a whole, it was the thoroughness of technique and specialisation in these foreign colleges that gave a most favourable impression. At the same time it should be mentioned that the division of the veterinary schools into separate, and rather water-tight, Institutes for anatomy, physiology, pathology, etc., has the possible danger of these departments becoming too independent of each other.

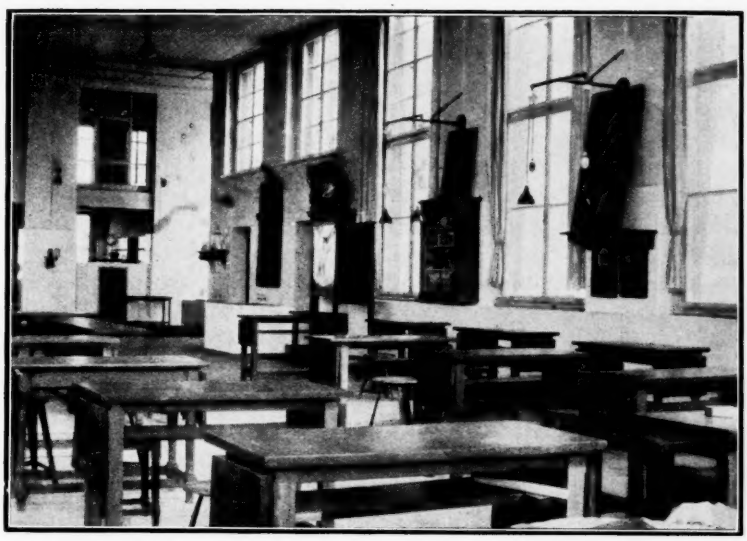
In conclusion, may I assure anyone who feels tempted to undertake a similar trip, that no great knowledge of a foreign language is necessary ; travel can be made cheap, and a ready reception at the foreign colleges can be relied on. Finally, I want to say that the notes of introduction given me by Sir Frederick Hobday were no doubt largely responsible for the readiness with which our foreign colleagues received us, and indicate the respect his name calls up wherever one travels in the veterinary world.

# Clinical Articles

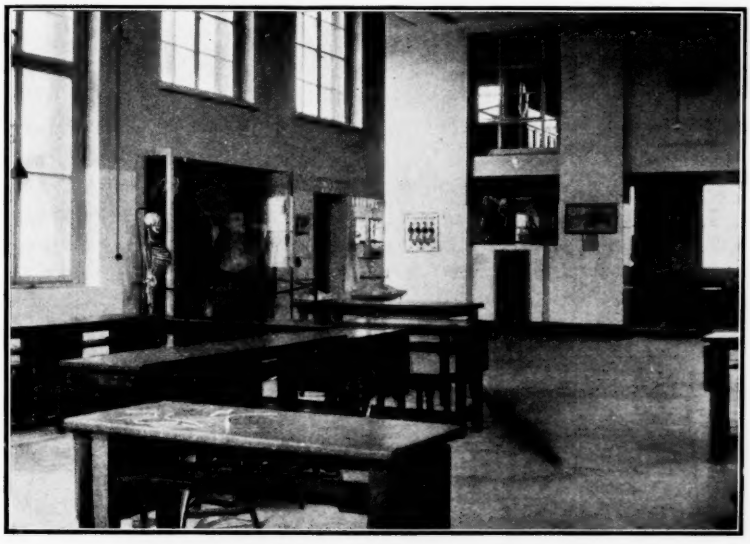
## Indigestion and Gastritis in the Dog.

By G. MAYALL, M.R.C.V.S.

ONE of the most frequent requests we receive from owners of dogs is to prescribe something to allay vomiting and put the dog on to his food again. There is no more often repeated case to which we are called than that of a dog whose appetite



View of dissection room, Leipzig, showing tables.



View of dissection room, Leipzig, showing a preserved half-section of a horse.

(*Article by* C. W. Ottaway, M.R.C.V.S., *page* 451)

is variable or greatly impaired; vomiting and retching may be frequent and noticeable a short time after eating. Food particles thrown up may be mucus-coated or blood-tinged. Constipation usually present may be followed by diarrhœa. At other times a dog lies listless and semi-comatose, showing all the symptoms of toxæmia.

In the past, to remedy these cases we have depended chiefly on preparations of bismuth, soda bicarb. and medicinal paraffin, and sometimes on small doses of hydrochloric acid and pepsin. The results have not been too good. Recently two preparations have come on the market that we have found very useful in canine and feline practice where there have been indigestion, catarrhal gastritis, perhaps gastro-enteritis and toxæmia.

The two medicinal agents are called Kaosorb and Kaosorb-ol, and are both Kaolin derivations, the latter being an emulsoid in a watery suspension, and highly viscous liquid paraffin. Kaorsob is said to adsorb putrefactive toxins, and toxins once fixed by the Kaosorb cannot easily be removed. It is also a protective, sedative and analgesic; changes the intestinal flora and is consolidating (hence useful in diarrhœa).

Medicinal remedies are constantly changing, and it does not do always to accept as gospel all that is written about them. The discerning man will endeavour to prove the value of some of them if he wishes to keep abreast of the times in medicine and therapeutics, and so far we have been pleased with the action of these remedies in canine and feline practice.

*Case* 1.—A fox-terrier off his feed, vomiting occasionally, chiefly biscuit fed; no temperature, mouth pasty, was put on teaspoonful-doses of Kaosorb in water, a milk diet and dried bread or toast. He made a very good recovery in seven days' time.

*Case* 2.—An Airedale dog off his feed with intermittent diarrhœa was put on dessertspoonful doses of Kaosorb in water. The diarrhœa ceased in three days and normal stools were produced, and from a lethargic and evidently sick dog he became his old self again. Here again the diet was at fault and advice was given regarding it.

*Case* 3.—A cat, sleepy and indifferent to food, quiet and lethargic, was brought in and kept under treatment for a week, being given small doses of Kaosorb-ol. At the end of the week he was retaining his milk and some Ken-l-Ration, and was discharged cured.

We have used these remedies as indicated by symptoms in one other cat and in a second fox-terrier, a Labrador retriever, and a spaniel, and have been well satisfied with the results, as have been the owners also.

Considering the frequency of these gastro-intestinal cases in canine and feline practice and the results we have had, we think these two remedies are worthy of recommendation and trial by veterinary practitioners.

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## Cryptorchids.

By JAMES TAGG, late Major R.A.V.C.

DURING the two years I had command of a veterinary hospital, *viz.*, 1916 and 1917, I had nine " cryptorchids " sent me for operation. There were three of these which appeared abnormal both in the number of testicles and their situation in the abdominal cavity. They were all *retentio abdominalis* cases; from one of which I took two abnormally large testicles and a piece of testicular substance which macroscopically appeared to be glandular tissue. In operating on this case, of the near side from which I had extracted a large testicle, I noticed the cicatrix of a previous operation of the off side. Thinking he had been castrated in the ordinary way, I allowed the patient to rise. He made a rapid recovery, and was placed in the discharge lines. About a month after the staff sergeant in charge came and informed me the patient had got loose and served a mare. I decided to operate on the side of the old cicatrix, *viz.*, on the off side. In the internal abdominal ring I found a piece of what appeared to be glandular tissue. It did not appear to me large enough to warrant his serving a mare, so I broke through the abdominal wall near the inner ring, and another large testicle seemed to hit my hand as I introduced it in the abdominal cavity. This I took away and allowed the patient to rise; he made a good recovery and was sent back to remounts.

In another case I operated upon, the testicle was adhering to what I seemed to think the top of the bladder. Anyone used to these operations knows how difficult it is to break down these adhesions with one hand, coupled with the pressure of the abdominal wall on one's arm. So painful has it been that on one occasion I had to withdraw my hand and arm for a moment or two. This case made a good recovery and was returned to remounts.

In another case I found the testicle right forward. It was so far forward that I could not believe it was the testicle until I found the spermatic cord. This also made a good recovery.

### Modus Operandi.

It is rather singular in my case that I had never seen the operation performed by any one else. The patient was thrown and chloroformed to a complete state of anæsthesia. The leg on the side to be operated upon brought forward as for ordinary castration. The patient rolled over, and sandbags placed on each side. The inguinal ring is easily found. An incision about two inches long is made over the region of the ring, and the two forefingers introduced from the outer to the inner abdominal ring. Now I found I could break through the wall on the inner side of the ring and the internal oblique muscle much easier than keeping to the inner ring. I always used animal catgut to ligature the cord, and cut the cord about two inches below the ligature with the " écraseur." All around the parts were rendered aseptic with hydrarg. perchlor. The incision through the skin was sutured with strong flax thread. The patient was placed in a stall with the

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forelegs quite a foot or more lower than the hind, so as to relieve the pressure from the region of the abdominal wall where operated upon.

### An Abnormal Testicle.

A large testicle that had been taken from an Afghan stallion was brought to me by an assistant veterinary surgeon in Calcutta. It was as large as a man's head, and I found on making a section through it I was obliged to use a saw. In the middle of the testicle was a fine ball of hair the same colour as the stallion. On examination I found skin, glandular tissue, then cartilage, compact tissue and bone; then towards the centre again, cartilage, glandular tissue, slight connective tissue, skin to the bag of hair. On making a section of the inner glandular tissue, stained with hematoxylin, with a counterstain of eosin, I found spermatozoa in all stages of formation, in fact, quite normal. The seminiferous tubules were quite normal. I also made a section of the cartilage and compact tissue of bone, which was quite normal in both cases.

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## Melanotic Tumours.

By JAMES TAGG, late Major R.A.V.C.

It is surprising what a number of melanotic tumours one finds in India. I wish to state I am not recording these as being new to the readers of the Journal, as I expect they come across these frequently in their practices; but this of a grey Arab, which appeared to be due to an accident, I thought singular, inasmuch as it was of an abnormal size, and situated in a difficult part for successful extirpation.

I used to drive a pair of grey Anazeh Arabs for going long distances. During one of my journeys on inspection duty the river had overflowed, and they put a good causeway of earth and rubbish on the road so as to facilitate wheel traffic. On passing over the causeway the off-side horse slipped over the edge of it and fell. We extricated the poor beast and found he went lame behind. He was walked home and recovered from his lameness, and went to work again. After about two months he began to swell on the flank in the region of the tensor vaginæ muscle. After some time it became well circumscribed, and from palpation it appeared to be fixed on the internal abdominal muscle about the region of Poupart's ligament. I decided to operate as it began to be too large for him to get about with. He was cast and chloroformed, using a Carlisle inhaler, and placed in a state of complete anæsthesia.

### Modus Operandi.

An incision about four inches from above downwards was made in the tensor vaginæ, and after dissecting it away from the cuticle, was broken down by hand. It had quite a large well-defined pedicle. This was ligatured with animal catgut, the ecrazeur placed over it and brought away. The muscle and skin were brought together with strong flax thread, and the patient was allowed to rise. He had

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been under chloroform for an hour, as one had to be very particular in this peculiar region. I think it was the worst case I had ever operated upon. It was as large as a man's head, full of an inky-like substance, as they all are. I sent this home for the College Museum during the incumbency of Sir John Macfadyean. The patient made a good recovery. There was a great hollow left in the flank, but he was hale and hearty in 1900.

Another curious case I had was an old grey country-bred from the Punjaub, belonging to an old favourite orderly, an old Mutiny man who belonged to Brazier's Sikhs. This case was frequently brought to me with what appeared to be bad attacks of colic. After the usual application of remedies the old horse used to return to work quite happy. On one occasion in backracking him I touched a hard substance that appeared resistant. After closer examination I found it to be a tumour. Now the difficulty was how to get at it. I had a dilator, and with an ovariotomy knife I worked around as superficially as I could so as not to get too much hæmorrhage. With the écraseur over my hand, I introduced it into the anus, and placed it around the tumour—which was not easy—and excised it. I syringed it out with a styptic, and the patient made a good recovery. It was this which had caused stoppages to the fæces, and after removal of the tumour I had no further trouble.

During the War I had one fixed on the ribs of a grey horse which weighed 2 lb. That was excised satisfactorily, and the horse was returned to his squadron for one of the pushes at the end of the year 1917.

# News

## R.A.V.C. OLD COMRADES ANNUAL DINNER.

THE Fifteenth Annual Re-union Dinner of the R.A.V.C. Old Comrades Association was held at Anderton's Hotel, Fleet Street, London, on Friday, October 4th, at 7.30 p.m., and the attendance, which included Major-General Sir John Moore, W. S. Anthony, and the present Director-General, Major-General J. J. Tapley, was well above the average. Sergt. O'Reilly, as usual, contributed the sketch for the menu card, and the whole evening was a great success.

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## STUDENT ENTRIES IN THE UNITED STATES.

DURING an Address by President MacKellor before the American Veterinary Medical Association at the seventy-second Annual Meeting held at Oklahama City, U.S.A., August 27th, 1935, the President said: "In spite of the fact that veterinary schools are raising their entrance requirements, more young men are seeking admission to-day than ever before; more, in fact, than can be accommodated.

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